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Caenidae from Madagascar (Insecta: Ephemeroptera)

By Peter Malzacher, Ludwigsburg

With 7 figures

Summary

5 new species of the genus *Caenis* and one species of the **new** brachycercine **genus** *Madecocercus* from Madagascar are described. The larvae of all species are unknown. The relationships of the new species are discussed.

Zusammmenfassung

Von Madagaskar werden **5 neue Arten** der Gattung *Caenis* beschrieben, sowie eine Art der **neuen Gattung** *Madecocercus*, die zur Unterfamilie Brachycercinae zu zählen ist. Die Larven aller Arten sind unbekannt. Die Verwandtschaftsverhältnisse der neuen Arten werden diskutiert.

Contents

1. Introduction

While 33 species of the Caenidae are known from the African continent (revised by Malzacher 1993) the occurrence of the family in Madagascar is verified by only one paper by Demoulin from 1974. He described 3 larval specimens from lake Itasy as *Austrocaenis* spec. Imagines were unknown. Some time ago I got the here de-

scribed material, imagines only, from Dr. ELOUARD from the ORSTOM. It shows that the family is widely distributed with at least 2 genera.

I wish to thank Dr. J.-M. ELOUARD (Antananarivo) for leaving me the material for study.

2. Descriptions

2.1. Genus *Madecocercus* gen. nov.

Type-species: *Madecocercus tauroides* spec. nov.

Male: Pedicel 2.5 times length of scape, the apical third tapered. Base of the antennal flagellum not dilated. Coxae widely separated; prosternum broad, rectangular. Metanotum flat, without transverse ridge. Distal part of the wing between the tip and the cross vein between R1 and R2 about 1.3 times length of basal part. Abdomen with lateral filaments on the segments 5–8 (5 with short filaments, 6 and 7 with filaments at least as long as the segment concerned and 8 with filaments of medium length). Lateral filaments not bent dorsally. 9th segment without caudolateral spines. Genitalia with large and strongly sclerotized lateral-sclerites which don't spread out basally and are not connected with the basolateral-sclerites. Styliger-sclerite sparsely developed, with two paramedian apophyses. Forceps strongly bowed, with a small groove on the inner margin. Cerci three times and terminal-filament 3.5 times length of body.

2.1.1. *Madecocercus tauroides* spec. nov.

Material

Holotypus ♂ (micro-slide): Madagascar, riv. Mangoro, 13. V. 91 leg. ELOUARD (BMNH)[1]).

Further material: 2 ♂♂ subimagines from the rivers Mangoro and Onilahy (ORSTOM[2]) and author's collection).

Male

Body length: 3.8–5.4 mm; wing length: 3.5–4.5 mm; length of fore leg: 4.1 mm. Ratio of fore femur : fore tibia = 0.44; ratio of fore tibia : fore tarsus = 1.54; ratio of fore leg : hind leg = 2.23; ratio of first segment of the fore tarsus : 2nd : 3rd : 4th : 5th = 1 : 2.7 : 1.8 : 1.7 : 1.6. Ratio of body length : length of cercus : length of terminal filament = 1 : 3.0 : 3.5.

Coloration of chitinous layers: Mesonotum dark-brown, head, pronotum and metanotum, mesosternum, metasternum and pleura as well as the legs a little lighter, abdomen only weakly brownish.

Epidermal pigmentation: Head and pronotum with a strong blackish-brown pigmentation, the latter with the usual lightenings. The other parts of the thorax and the legs here and there with pigments of different intensity. The abdominal tergites 1, 2 and 7–10 heavily pigmented, tergites 3–6 weakly.

Antenna (fig. 1e), prosternum (fig. 1c), metanotum (fig. 1d) and lateral filaments of the abdominal segments correspond to the description in the diagnosis of the genus.

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[1]) *BMNH* = Natural History Museum, London [formerly British Museum (Natural History)].

[2]) *ORSTOM* = Institut Français de Recherche Scientifique pour le Développement en Coopération.

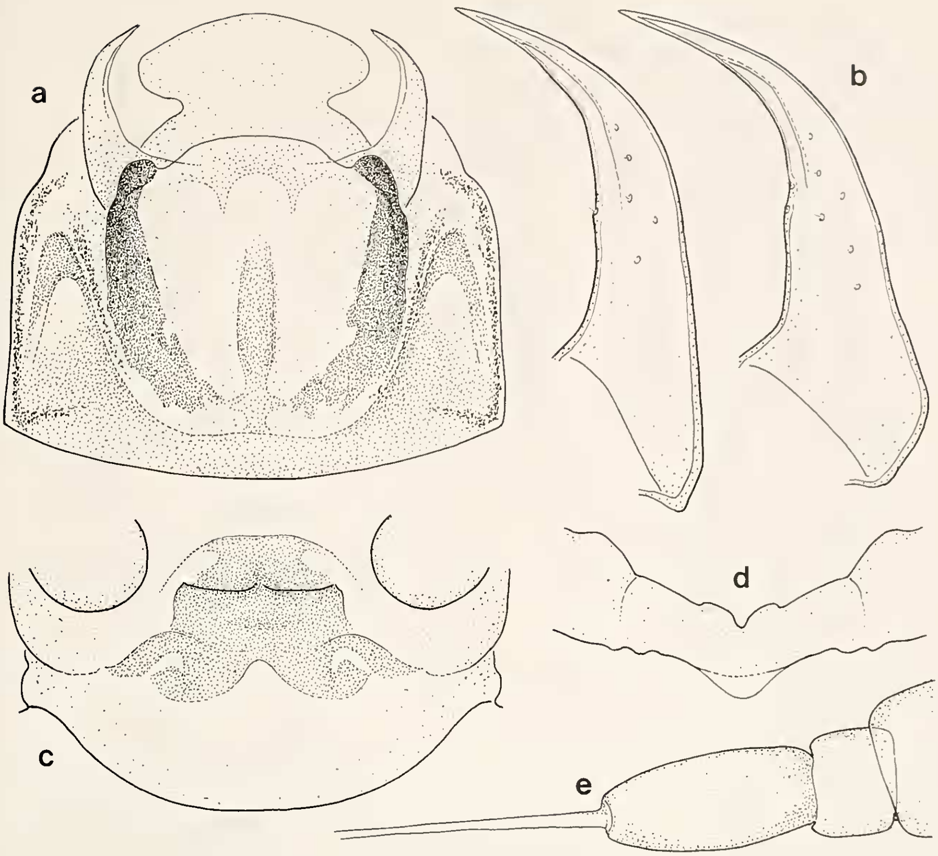


Fig. 1. *Madecocercus tauroides* gen. nov. et spec. nov.; male. – a. Genitalia; – b. forceps; – c. prosternum; – d. metanotum; – e. antenna: scape, pedicel and base of the flagellum.

Genitalia and 9th sternite like in fig. 1a. Lateral-sclerites deep-brown and strongly sclerotized overlapping the forceps-base with her caudal parts. Penis-lobes and hind margin of the penis rounded, without a median incision. Forceps as in fig. 1b, with a small groove and few sensillae in the median part.

Female and larval stages are unknown.

2.2. Genus *Caenis* Stephens 1835

Type species *Caenis macrura* Stephens 1835.

Antennal base of different shape and proportions. Prosternum narrow, triangular or with sides converging frontally. Metanotum with a transverse ridge. Abdominal segments with lateral filaments of different length, often short or very short. 9th segment with caudolateral spines. Genitalia with well developed styliger-sclerite with lateral apophyses. Lateral sclerites small and narrow, as a rule weakly sclerotized, clearly separated from the basolateral-sclerites. Forceps without grooves.

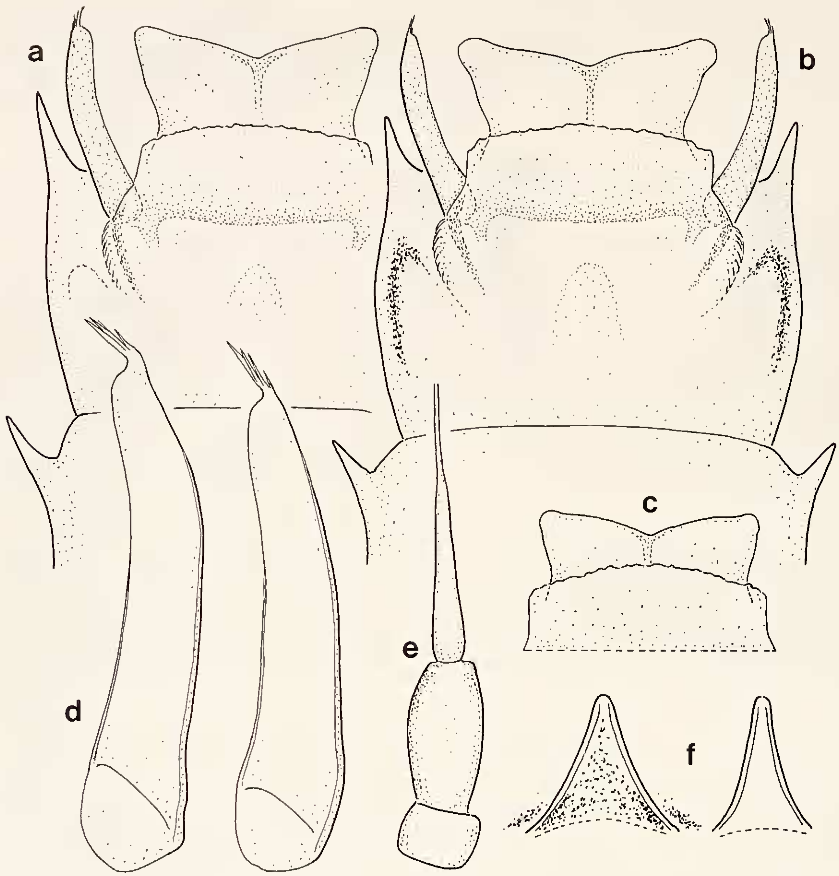


Fig. 2. *Caenis spinosa* spec. nov.; male. – a, b. Genitalia of two specimens with different shape of penis and lateral spines; – c. another penis-shape; – d. forceps; – e. antenna: scape, pedicel and base of the flagellum; – f. different shapes of prosternal triangle.

2.2.1. *Caenis spinosa* spec. nov.

Material

Holotypus ♂ (micro-slide); Madagascar, riv. Andratina aff. Mandrare, 12. IV. 92 leg. Elouard (BMNH).

Further material: Numerous ♂♂, ♀♀ and subimagines from the rivers Andranobe, Andratina, Ikopa, Manankazo, Mangoro, Menarandra, Namorona and Zomandao (ORSTOM and author's collection).

Male

Body length: 2.7–3.3 mm; wing length: 2.2–2.5 mm; length of fore leg: 1.7–2.0 mm. Ratio of fore femur : fore tibia = 0.61–0.70; ratio of fore tibia : fore tarsus = 1.37–1.52; ratio of fore leg : hind leg = 1.46–1.68; ratio of first segment of the fore tarsus : 2nd : 3rd : 4th : 5th = 1 : 1.8–2.2 : 1.2–2.0 : 1.2–1.8 : 1.1–1.5. Ratio of body length : length of cercus : length of terminal filament = 1 : 1.7–1.8 : 2.7–2.8.

Coloration of chitinous layers: mesonotum and metanotum yellow. Frontolateral part of the pleura brown, with dark sutures; dilated base of the antennal bristle

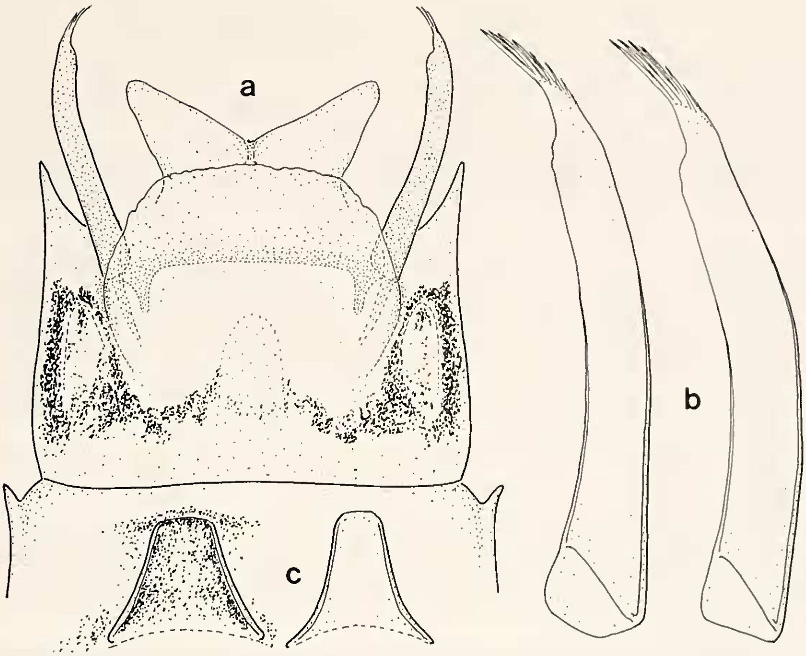


Fig. 3. *Caenis namorona* spec. nov.; male. – a. Genitalia; – b. forceps; – c. different shapes of prosternal triangle.

brownish, contrasting more or less with the pedicel. The other parts yellowish-white or white.

Epidermal pigmentation: dorsal pattern like in fig. 7a. A dark line on the ventral base of the head. Pigments are to be found also on the prosternal triangle – especially on the hind margin from where dark bands run to the lateral margins (fig. 2f, left) – on the margins of the coxal hollows, the fore femora, tibiae and tarsi. Middle and hind femora each with a distal spot at the hind margin.

– A very light-coloured species, remarkable the yellow thorax. –

Base of the antennal bristle dilated. Dilated part hardly half the width and about 1.5 times the length of pedicel (fig. 2e). Prosternal triangle mostly narrow, the tip pointed or a little rounded (fig. 2f). Lateral filaments of the abdominal segments pointed, triangular and of medium length (fig. 2a and b).

Genitalia and 9th sternite like in fig. 2a-c. Penis lobes short and broadly triangular. Styliger sclerite with short apophyses. Other sclerites weak and hardly to be seen. Only a small frontal part of the styliger and the forceps weakly brownish. Forceps curved, with a short tuft of about 4–5 spines (fig. 2d).

Female

Body length: 3.6–5.0 mm; wing length: 2.8–3.5 mm.

The coloration is similar to that of the males, mesonotum often a little darker, also the pigmentation of the abdominal tergites (not interrupted in the middle).

Eggs

Chorion nearly without structure, sometimes with very fine pores. With 2 flat epithemata and one micropyle of medium length flanked by two rows of pores.

2.2.2. *Caenis namorona* spec. nov.

Material

Holotypus ♂ (micro-slide); Madagascar, riv. Namorona, 22. IV. 92 leg. ELOUARD (BMNH).

Further material: Numerous ♂♂, ♀♀ and subimagines from the rivers Manamparihy and Namorona. A few ♂♂ from the rivers Mangoro and Zamandao (ORSTOM and author's collection).

Male

Body length: 3.0–3.6 mm; wing length: 2.2–2.6 mm; length of fore leg: 1.5–1.8 mm. Ratio of fore femur : fore tibia = 0.96–1.01; ratio of fore tibia : fore tarsus = 1.11–1.33; ratio of fore leg : hind leg = 1.21–1.26; ratio of first segment of the fore tarsus : 2nd : 3rd : 4th : 5th = 1 : 1.3–1.5 : 1.1–1.3 : 1.2–1.5 : 0.7–0.9. Ratio of body length : length of cercus : length of terminal filament = 1 : 1.75–2.00 : 2.50–3.00.

Coloration of chitinous layers: thorax pale yellowish-brown. Other parts yellowish-white.

Epidermal pigmentation: dorsal pattern like in fig. 7c. Pigments are also widely distributed on the ventral side: on the prosternal triangle (fig. 3c, left), the meso- and metasternal sutures and on the sternites of the abdomen. Sternites 2–6 often with a dark median spot.

– Altogether a species with a medium colour primarily caused by the epidermal pigmentation. –

Base of the antennal bristle dilated (like in fig. 2e). Prosternal triangle broad (fig. 3c). Lateral filaments of the abdominal segments short.

Genitalia and 9th sternite as in fig. 3a. Penis lobes long triangular. Forceps (fig. 3b) very long surpassing the penis caudally (fig. 3a), apically with a tuft of about 10 spines. Only a small frontal part of the styliger and the forceps weakly brownish. Basal and lateral parts of the 9th sternite with blackish-brown pigments.

Female

Body length: 4.4–4.9 mm; wing length: 3.3–3.7 mm.

The coloration is very similar to that of the males, altogether a little darker. Tergites often with continuous bands.

Eggs

Chorion nearly without structure. With 2 very flat epithemata and one micropyle of medium length near the equator.

Larval stages are unknown.

2.2.3. *Caenis johannae* spec. nov.

Material

Holotypus ♂ (micro-slide); Madagascar, riv. Mandrare, 13. IV. 92 leg. ELOUARD (BMNH).

Further material: Numerous ♂♂, ♀♀ and subimagines from the rivers Fiherenana, Mandrare and Onilahy. A few ♂♂ from the rivers Menarandra and Namorona (ORSTOM and author's collection).

Male

Body length: 2.5–3.0 mm; wing length: 2.1–2.3 mm; length of fore leg: 1.4–1.6 mm. Ratio of fore femur : fore tibia = 1 : 0.85–1.04; ratio of fore tibia : fore

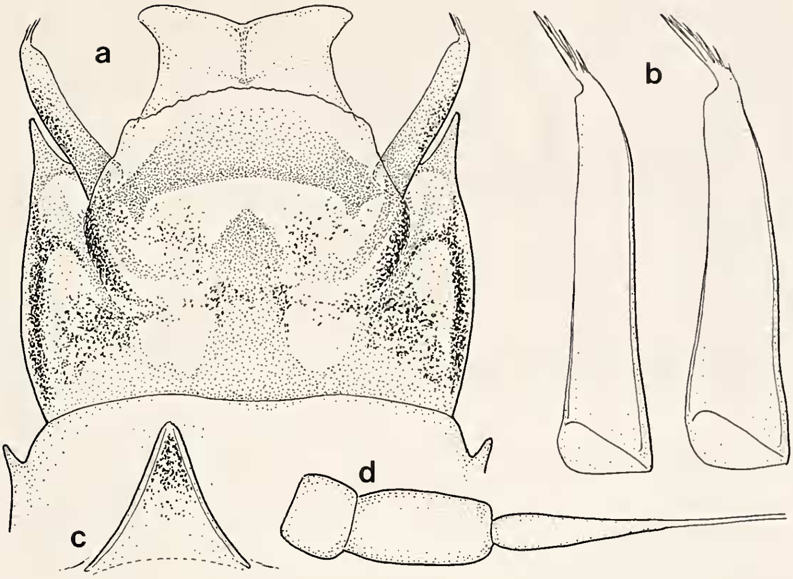


Fig. 4. *Caenis johannae* spec. nov.; male. – a. Genitalia; – b. forceps; – c. prosternal triangle; – d. antenna: scape, pedicel and base of the flagellum.

tarsus = 1.31–1.42; (tibia as a rule a little longer than femur and tarsus, femur a little longer as tarsus); ratio of fore leg : hind leg = 1.07–1.17; ratio of first segment of the fore tarsus : 2nd : 3rd : 4th : 5th = 1 : 1.3–1.5 : 0.9–1.2 : 0.7–1.1 : 0.8–1.2. Ratio of body length : length of cercus : length of terminal filament = 1 : 1.5–2.0 : 2.5–3.0.

Coloration of chitinous layers: mesonotum and frontolateral part of the pleura intensively tobacco-brown; head and the rest of the thorax a little lighter brown; abdomen yellowish. The mesonotum shows characteristic lightenings at the fore corners, the wing-bases and the V-shaped suture.

Epidermal pigmentation: dorsal pattern as in fig. 7b. Besides this there are pigments on the base of the labial rudiments, on the top of the prosternal triangle (fig. 4c), on meso- and metasternum. Abdominal sternites with more or less strongly pigmented transverse bands. Middle and hind femora each with a distal spot at the hind margin.

– The species shows a strong colour caused together by both components, coloration of chitinous layers and epidermal pigments. –

Base of the antennal bristle dilated; dilation about half as broad as the pedicel (fig. 4d). Prosternal triangle equilateral and pointed (fig. 4c). Lateral filaments of the abdominal segments short, triangular.

Genitalia and 9th sternite like in fig. 4a. Penis lobes short triangular. Styliger sclerite with short apophyses. Central sclerite frontally elongated. Forceps more or less straight, with an apical tuft of 4–7 spines (fig. 4b). Epidermal pigments widely distributed on the 9th sternite, also on the lateral parts of the forceps.

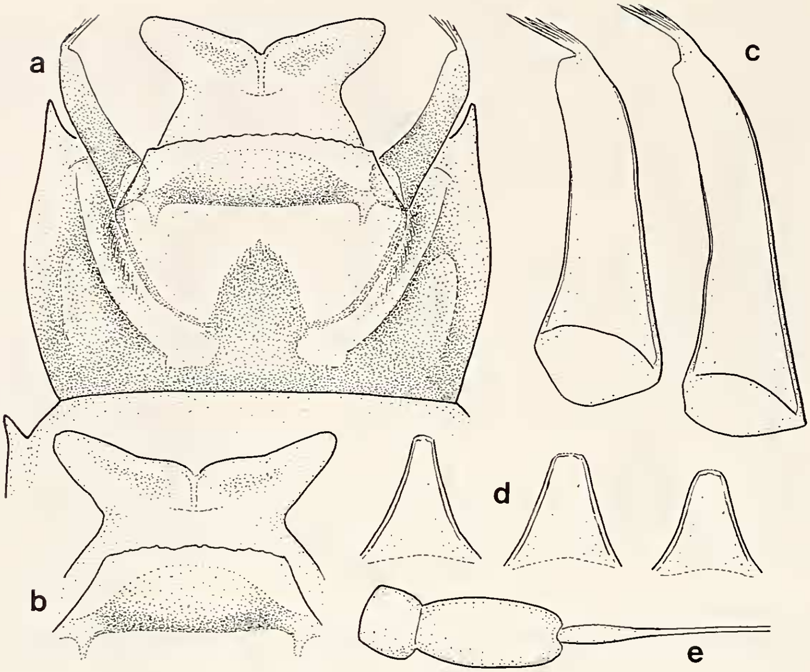


Fig. 5. *Caenis rugosa* spec. nov.; male. – a. Genitalia; – b. another shape of penis; – c. forceps; – d. different shapes of prosternal triangle; – e. antenna: scape, pedicel and base of the flagellum.

Female

Body length: 3.5–4.2 mm; wing length: 2.4–3.1 mm.

The coloration is similar to that of the males. The ligthenings on the mesonotum are often extended to the whole field between the V-shaped suture or the fields beside it.

Eggs

Chorion with very fine pores. Two flat epithemata with small knobs. The micropyle lies on the equator.

2.2.4. *Caenis rugosa* spec. nov.

Material

Holotypus ♂ (micro-slide); Madagascar, riv. Andratina aff. Mandrare, 12. IV. 92 leg. ELOUARD (BMNH).

Further material: Numerous ♂♂, ♀♀ and subimagines from the rivers Andratina, Menarandra and Zamandao. A few ♂♂ from the river Mangoro (ORSTOM and author's collection).

Male

Body length: 2.2–2.7 mm; wing length: 1.9–2.1 mm; length of fore leg: 1.3–1.4 mm. Ratio of fore femur : fore tibia = 0.55–0.66; ratio of fore tibia : fore tarsus = 1.43–1.79; ratio of fore leg : hind leg = 1.39–1.55; ratio of first segment of the fore tarsus : 2nd : 3rd : 4th : 5th = 1 : 1.6–2.2 : 0.9–1.4 : 0.9–1.3 : 1.1–1.4. Ratio of body length : length of cercus : length of terminal filament = 1 : 2.5–2.6 : 3.3–3.5.

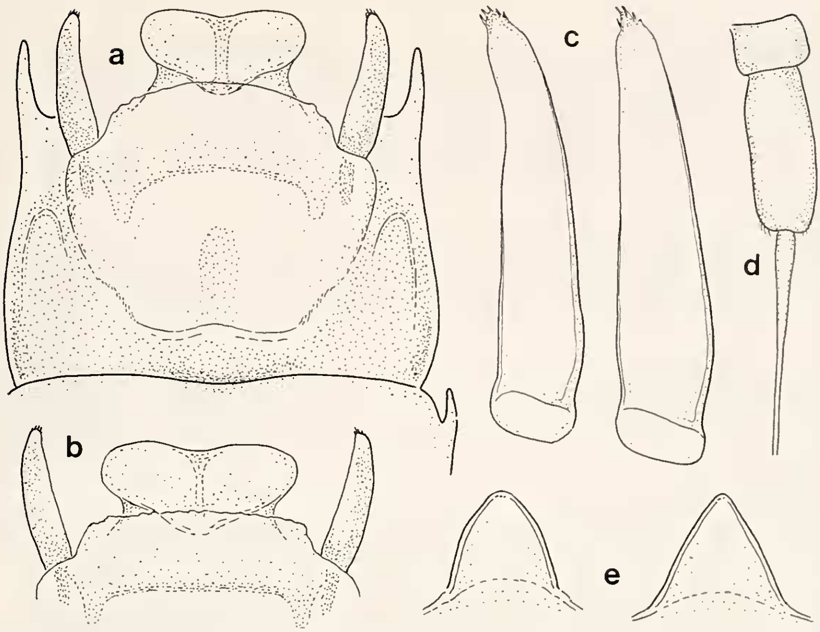


Fig. 6. *Caenis rutila* spec. nov.; male. – a. Genitalia; – b. another shape of penis; – c. forceps; – d. antenna: scape, pedicel and base of the flagellum; – e. different shapes of prosternal triangle.

Coloration of chitinous layers: mesonotum, metanotum and most of the pleura strongly maroon. Pronotum, parts of head and prosternum as well as mesosternum and metasternum a little lighter. The other parts more or less yellow-brownish. Middle and hind tibiae and tarsi brown, femora with brown margins.

Epidermal pigmentation: head and prothorax sparsely and diffuse pigmented, also the abdominal tergites, tergites 3–6 stronger. Fore legs pigmented, especially the tips of the tibiae, also the base of the ringed cerci.

– Altogether a species with a medium brown colour primarily caused by the coloration of the chitinous layers. –

Base of the antennal bristle only slightly dilated. Dilation a little more than half the length of pedicel; brownish. (fig. 5e). Tip of the prosternal triangle rounded or more or less broadly blunt (fig. 5d). The surface of the triangle shows a fingerprintlike pattern (also to be seen in some other species, but not as clearly). Lateral filaments of the abdominal segments short triangular.

Genitalia and 9th sternite like in fig. 5a and b. Penis lobes elongated with brown sclerites on the dorsal surface shining through to the ventral side. Styliger sclerite narrow, with short apophyses. Central sclerite rounded. Forceps like in fig. 5c, short and with an apical tuft of 4–5 spines. Forceps, sclerites and base of the 9th sternite brown.

Female

Body length: 2.8–3.5 mm; wing length: 2.3–2.6 mm.

The coloration is very similar to that of the males.

Eggs

Chorion without pores. Epithemata voluminous and with very small knobs. With 2(–3) long and thin micropyles laying in the equatorial region of the egg; more or less inclined.

2.2.5. *Caenis rutila* spec. nov.

Material

Holotypus ♂ (micro-slide); Madagascar, riv. Mangoro, 15. XI. 91 leg. Elouard (BMNH). Further material: Numerous ♂♂, ♀♀ and subimagines from the river Mangoro. A few specimens from the rivers Manankazo and Namorona (ORSTOM and author's collection).

Male

Body length: 2.5–2.8 mm; wing length: 2.4–2.6 mm; length of fore leg: 1.9–2.1 mm. Ratio of fore femur : fore tibia = 0.64–0.75; ratio of fore tibia : fore tarsus = 0.98–1.28; ratio of fore leg : hind leg = 1.50–1.62; ratio of first segment of the fore tarsus : 2nd : 3rd : 4th : 5th = 1 : 3.0–3.3 : 1.7–1.8 : 1.4–1.8 : 1.0–1.4. Ratio of body length : length of cercus : length of terminal filament = 1 : 2.5–2.8 : 3.0–3.5.

Coloration of chitinous layers: pronotum, mesonotum and metanotum, pleurae, margins of the femora and strongly chitinous parts of the 10th tergite reddish-brown. Other parts light yellowish.

Epidermal pigmentation: Dorsal part of the head, pronotum and abdominal tergites only weakly pigmented, the margins and a median band on the pronotum a little darker, also tergite 1, 2, 6 and 7. There is a concentration of pigments on the hind margin of the 6th and the fore margin of the 7th tergite which is a typical character of this species.

– A species with a medium reddish colour. –

Base of the antennal bristle slightly dilated (fig. 6d). Prosternal triangle broad, with convex or bent sides and the tip more or less rounded (fig. 6e). Lateral filaments of the abdominal segments of medium length.

Genitalia and 9th sternite like in fig. 6a and b. Penis with short round lobes and a distinct transverse fold. Styliger sclerite with short and broad apophyses. All sclerites weak and hardly to see. Lateral sclerite very short. Forceps like in fig. 6c. With 4–5 very short apical spines; a little contracted at the base, inserting in a concavity of the hind margin of the styliger; hardly sticking out laterally.

Female

Body length: 3.0–3.4 mm; wing length: 2.8–3.3 mm.
The coloration is very similar to that of the males.

Eggs

Chorion with a very fine granulation. 2 flat epithemata. One short micropyle.

Larval stages are unknown.

3. Relationships

Although there are some different characters the new genus *Madecocercus* seems to be related more closely to the African genus *Afrocercus* Malz. (Malzacher 1987) than to the other genera of the subfamily Brachycercinae, revised by Soldan (1986).

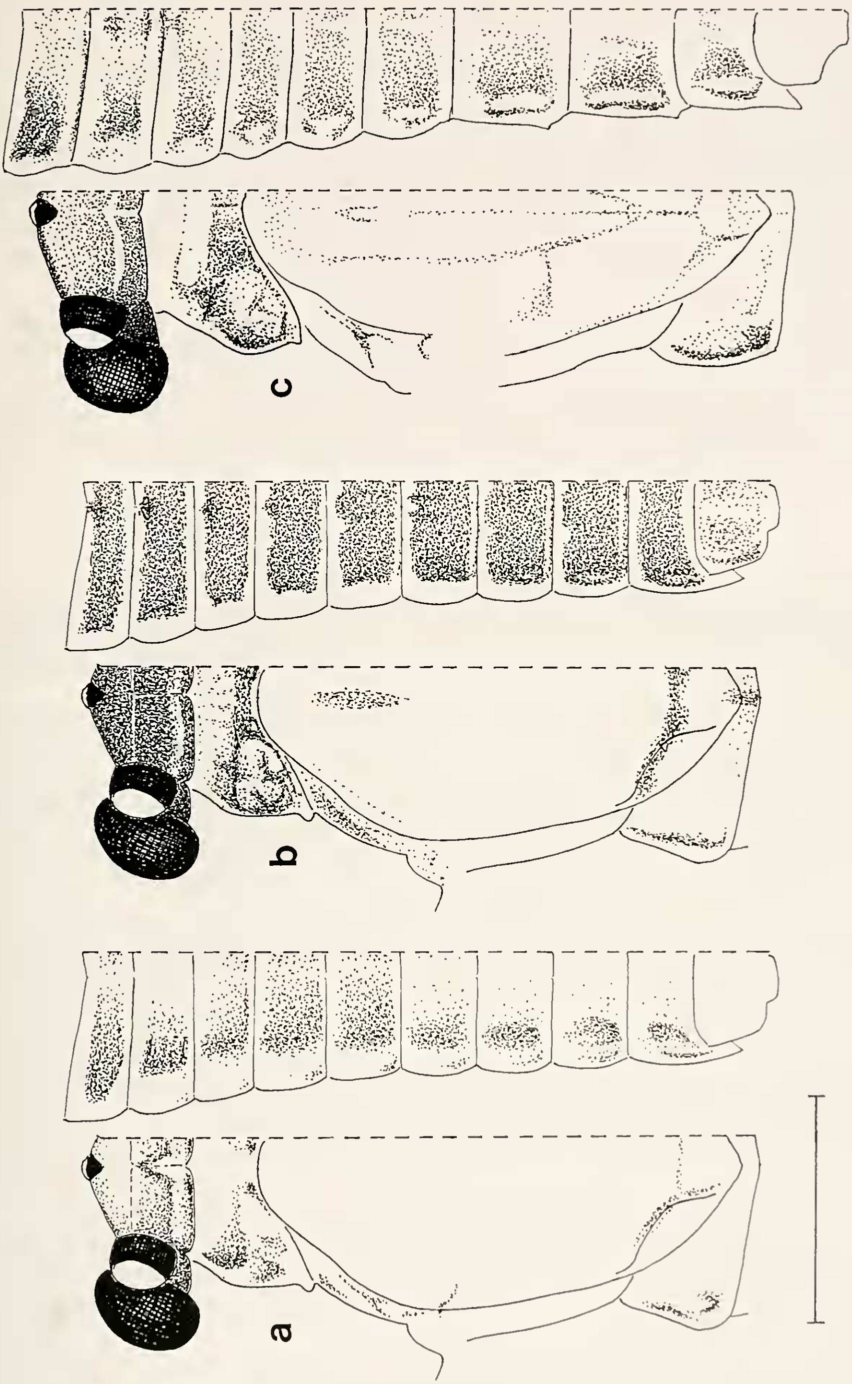


Fig. 7. Pattern of the epidermal pigmentation; left half of the body. – a. *Caenis spinosa* spec. nov.; – b. *Caenis johannae* spec. nov.; – c. *Caenis namorona* spec. nov. – Scale bar: 0.5 mm.

Characters in common to both genera are: the strongly bowed forceps with only a short groove on the inner margin, a distinct overlapping of the forceps base by the lateral-sclerites and the very weak differentiation of the styliger-sclerite with apophyses very close to the middle. The shape of the forceps and the reduced styliger-sclerite may possibly be considered a synapomorphy.

On the other hand *Madecocercus* gen. nov. shows a character that can be considered as a synapomorphy of Caeninae and *Tasmanocoenis*: the separation of lateral-sclerite and basolateral-sclerite. Because of that and because of the bowed forceps the genitalia of *Madecocercus* are a little similar to those of *Tasmanocoenis* species whose lateral-sclerites are voluminous, too (see MALZACHER 1987, fig. 2a and ALBA-TERCEDOR & SUTER 1990, fig. 1).

The new species *C. spinosa, C. namorona, C. johannae* and *C. rugosa* are very similar to the African species of the *C. scotti*-group, the *C. brevipes*-group and the *C. jinjana*-group which are closely related (see MALZACHER 1990, 1993). *C. rutila* spec.nov. however shows characters such as rounded penis-lobes, hardly developed sclerites and the simple forceps shape that may indicate an early derival from plesiomorphic African species.

4. Literature

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